Computer History Museum

Oral History of Lucio Lanza, part 2 of 2

Interviewed by:
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Doug Fairbairn: We're here at the Computer History Museum for a second oral history with Lucio Lanza. It is December 10, 2013. And we're going to pick up where we left off in the previous interview. And Lucio had previously described the 8086 generation of microprocessors at Intel where he was working as a marketing manager. And he's now going to pick up and fill in some important events around the 8086, and specifically the Crush program, after which we'll move on to the next topics. So--

Lucio Lanza: Yeah, the Crush program was a very interesting program. I think that we realized that the 8086 was what it was and clearly, we could not change it.

Fairbairn: Meaning what? It had--

Lanza: The architecture of the '86 was a little bit maimed, if I can use a polite version of a-- and I don't know if I talked about this last time? I probably did. But, fundamentally, the '86 was maimed because it was considered an intermediate step. The real big step was the 432, at the time called the 8816 and then 8832. Object-oriented, fantastic architecture from a computer science point of view. Definitely superior to anything the 8080 or the 8080-successors could be. The 8086 ended up being maimed, for example, by having only four segments, because the higher number of segments was going be dedicated to the next architecture by having therefore only one megabyte of addressability, which wasn't a lot. The two top bits of the address would be used to select the segment. So only one megabyte. And also had other fundamental problems in terms of the way the I/O was organized. So it was really, really, really a difficult thing to consider as a general-purpose architecture.

Fairbairn: So, it was not just a requirement that it be compatible with previous generation, like the 8008 or whatever--

Lanza: No.

Fairbairn: --but it was-- it had many other constraints on it that were imposed.

Lanza: In fact, the requirement of compatibility was practically not there, because on the 80-- what the 8085 and the 8086-- the 8080 had the requirement object-code compatibility.

Fairbairn: Mm-hm.

Lanza: The '86 and the '85 or '88, they required assembly-level compatibility. And you and I know very well, assembly-level compatibility means nothing. <laughs> There's no compatibility really. It means we

have abstraction. So, if I have an abstraction, I can find it there. But it was very, very limited in terms of constraints, from a compatibility point of view. Not only that, but the funny thing is that the person in charge of the 8086, Jean Claude Cornet, was in charge, but the architect was Bill Pullman. Now Bill Pullman had come to Intel from Western Digital where he was in charge of the LSI-11, which was a perfectly flat architecture.

Fairbairn: Mm-hm.

Lanza: If you look at the LSI-11, if you want a general Digital DEC PDP-11 architecture, you look at the 68000. You can see it was the same fundamental concept: Make things very simple, make things very flat, make them very symmetrical.

Fairbairn: Mm-hm.

Lanza: You look at the '86 and it's kind of jump into the past. And Bill Pullman was in charge, and he was the one who had to make it successful, which he did. But, fundamentally, it was not his passion and definitely was not something he would have designed. And he and I, we did talk about that many, many times and he was always very polite with me when I was pointing this thing out until we would go out and have a couple of beers and then he would get less polite--

Fairbairn: <laughs>

Lanza: --how much of impolite I was in pointing out the problems. But anyway, what was happening is that clearly, we were getting feedbacks from the customers that say 68000 is so much more powerful as an architecture, so much nicer, so much more symmetrical, so much-- etcetera, etcetera. So, on one side, as I said last time, what we did was-- we couldn't change that so we started talking about the fact Intel was gonna provide the entire system.

Fairbairn: Mm-hm.

Lanza: What is the processor after all? What is the CPU in a system that-- where the processor is in? It's five percent of the cost, ten percent. The rest of the cost is the peripherals, is the display. We talked about last time.

Fairbairn: Mm-hm.

Lanza: Is the communication, is the hard disk. So we had that approach from a general peripheral, a full-system approach. We're going all the way to the kernel of an operating system, all those things. We were saying, "Let's show that we understand the system, not just the CPU. Because if we are concentrating just on the CPU, frankly we are not gonna win." And we are not gonna win the people's emotional support. We're want to win anyway, but we really felt that we were stuck behind the eight ball with this.

Fairbairn: Mm-hm.

Lanza: So I gotta do something. So we have to go out and tell people why you, Intel, are gonna do better than the other guys. By the way, even from a development system point of view, we were far superior. I mean what Intel had in terms of the other systems, it was definitely much, much better.

Fairbairn: Mm-hm.

Lanza: In terms of single-board computer, it was much better. So we knew that if we took the accent away from the processor and make it a bigger issue of the other things that we had, we could win.

Fairbairn: Mm-hm.

Lanza: In order to do that we had to organize a program, a program that would go out and talk not just about the CPU, but about the compilers and about the software on top of the CPUs…about the peripherals, about the entire picture of the system. And we wanted to just see if that would fly. And the name that we gave to the program-- the name was given a little later, but the name ended being Crush. We talk about why the name was that.

The first thing that we did when we thought that we wanted to see whether this thing would fly was to say, "Okay, let's go and see if we can pitch these successfully." And successfully was even from a reaction point of view, not just successfully giving the orders, <coughing; inaudible> where the story made it, where it would stick. So, we said, "Where can we go?" Well, guess where we went? We said, "Maybe the guys to go to are the Olivetti guys," because, of course--

Fairbairn: Mm-hm.

Lanza: --there were connections. They were one of the top three customers to begin with -- it was NCR, Olivetti and I never remember the third one. But NCR and Olivetti were two of the top three. So, we decided we're gonna go to Olivetti and make that. And I remember that at that point the people going to Olivetti were the people who could talk about the various things.

Fairbairn: Mm-hm.

Lanza: So, the team assembled was, I think, I believe was Robert Hartman for the compilers, or Ross-- Judy Ross for the compiler-- I don't remember which one came there. One or the other. Might be Judy. For the processor point of view, Bill Pullman went. From the general system point of view--

Fairbairn: It would be who?

Lanza: Bill Pullman--

Fairbairn: Bill Pullman.

Lanza: --he came there. And from the system in general-- so did other things-- Lucio, which could do that in Italian.

Fairbairn: <laughs>

Lanza: So, this was the basic theme, and there was one also for development systems. So, with the compiler and the other systems, it was four or five people. So, we all got on a plane and we flew to Milan and then from Milan we would go to Olivetti in Ivrea. And I remember that we were writing the foils on the plane, to tell you how well organized this thing was.

Fairbairn: <laughs>

Lanza: We were writing the foils on the plane and we landed in Milan. We finished the foils. We did not have an office in Milan. The office in Milan-- we had a distributor in Milan. His name--

Lanza: Okay. So we flew up there and, yeah, we wrote the foils on the plane. And then we got there, and we went to the office of Intel there, which Intel did not have an office, had a distributor. The name of the distributor was Elettra Trieste.

Fairbairn: Mm-hm.

Lanza: And Elettra Trieste, the president of Elettra Trieste was Ettore Accenti, who was the distributor for quite some time. And Intel was a very important portion with distribution-- operation and distribution company. So, went there and we wrote the foils there. We put them-- typewriter, put them in. And what

was-- whatever it was at the time. And, interestingly enough, the guy that was in charge of the entire delegation was Tom Lawrence.

Fairbairn: Tom Lawrence. Okay.

Lanza: Yeah, you should talk to Tom. He has a ton of stories. Tom Lawrence happened to be the President of Intel Europe.

Fairbairn: Mm-hm.

Lanza: And he flew in for the meeting from Thailand where he was on vacation.

Fairbairn: Oh. <laughs>

Lanza: So he flew in. We told him what we were doing. We went there and Tom Lawrence-- when we went Ivrea, Tom Lawrence was the first one to present and after that I think it was the software or the development systems, then it was the processor and so on. So, we give the presentation and truth is that the presentation was received very, very, very well. So, we came back from the Olivetti presentation and we gave feedback to management of Intel, Tom Lawrence in particular, and Dave House. I think Dave House was still in charge of the development systems. And it was clear that that experiment went well. So, we decided that-- management decided-- I wasn't deciding anything-- but management decided, the top management, that was a good thing, so we was gonna go and extend it and just duplicate it.

Fairbairn: Mm-hm.

Lanza: And I remember that when the decision was taken, we had the meeting in Santa Clara One, and the people that communicated to our level that we were gonna do this extensively. Davidow-- Regis McKenna was there. And Davidow described why this is important, how this was indeed we're gonna just deploy this to the entire sales force. We're gonna do it extremely quickly so that Motorola would be completely taken by surprise by this.

Fairbairn: Mm-hm.

Lanza: And I remember Davidow saying, "We developed the 8080. They develop the 6800. We developed the 8086 and they decided to develop the 68000. It's time to teach them not to do it again."

Fairbairn: <laughs>

Lanza: Literally, that was it.

Fairbairn: What a great quote.

Lanza: So we want to teach Motorola not to do it again. And, of course, he also said he didn't want to be quoted, but the program was gonna be called "Crash".

Fairbairn: <laughs>

Lanza: But Crash could be taken as badly from the industry and, in general, from a legal point of view. So instead we called it "Crush".

<laughter>

Lanza: But the goal was crash Motorola. So that was [where] the name came from. And so, we started working that way. We developed several teams. They would be working that way. We had teams of five people, exactly a replica of the thing we had done with Olivetti, which by the way, failed! Because Olivetti, while they were convinced that the 68000 was a dog with nothing around it, they decided that instead of going and switch to Intel, they would switch to Zilog.

<laughter>

Lanza: So from that point of view, we really-- we use an Italian expression-- that is an Italian expression, it was based on that, on the fact that if you cannot jump on top of a horse to ride the horse and you ask for help, somebody might come there and help you so you get on top of the horse. But sometimes the help is too big, so you end up on the other side of--

Fairbairn: The other side.

Lanza: --the horse.

Lanza: So, we decided what's called in Italian, "Saint Anthony, you made too big of a grace."

<laughter>

Lanza: "You helped me too much, Saint Anthony."

Fairbairn: Right.

Lanza: So that was-- so anyway, that is what happened. Of course, the Italian distributor was very mad because we didn't-- were not able to do it, but anyway. Out of that not succeeding, we still decided to duplicate this. And we developed-- I think we had initially five different teams of five people.

Fairbairn: Mm-hm.

Lanza: And they were deployed everywhere, everywhere. So, teams of five and it was the values teams. It doesn't matter. And I remember distinctly that we went all over the world. And this was such a high priority that all the activities that were happening on the architecture, many things were taking second place. And, in fact, I don't know if you ever saw this, but this is what was given to the people that were active people in the Crush project.

<break in recording>

<crew talk>

Fairbairn: Okay.

Lanza: So I don't remember whether this was '79 or '80, but it was exactly in that time frame. So, I remember I ended up going on the Crush presentations in Southern California. Burroughs was one where I remember I went there with Dave House. If I remember correctly, I went to Chicago for presentations and John Doerr was the sales person in Chicago.

Fairbairn: <laughs>

Lanza: So, we went everywhere. And we had very strong teams. It wasn't just me or one team. It was lots, lots, lots of people. And Dane Elliott was one of the people there.

Fairbairn: Mm-hm.

Lanza: And truth is that that thing did make a difference. We, fundamentally, I think, convinced people that the issue was not just gonna be an issue of a CPU. It was a much bigger issue. And things, I think, at that point, we started switching--

Fairbairn: Mm-hm.

Lanza: --the attention of people.

Fairbairn: How long did the Crush program remain in kind of this high priority, full-on mode? How long did it take to really turn things around and--?

Lanza: I would say at least two quarters, maybe three quarters, and-- yeah. I think two- three quarters. And some of the things that we did during that time was to move the entire accent from just being an issue of CPUs to being-- we talked about that-- of CPUs and peripherals and operating system and much more general thing: operating system and development systems. And I think we talked about that last time.

Fairbairn: Mm-hm.

Lanza: So, suddenly, we started talking about the general, entire system. So more talking about the computer company. A company that understood computer companies, and therefore it was presented to them a solution that was not just hardware. It was hardware, CPUs and peripherals, and operating systems and compilers and everything. So, this picture was the picture that Intel took and that was really the substance of the Crush. And that's why when we started talking about the Ethernet and graphics and so on, the Intel thing was fitting, and people understood we were talking their language.

Fairbairn: Mm-hm.

Lanza: Because most of the people we had were fundamentally computer companies. And they felt like we're gonna be providing them with much more of a total solution.

Fairbairn: So, these were companies that really understood the complexities of launching a computer architecture and that you needed all these pieces to make it work.

Lanza: Yes. And computer architecture wasn't just the architecture of the processor. Because we knew we were stuck. <laughs>

Fairbairn: Right.

Lanza: They were not the best, but it was the architecture of the entire system. And we kept talking about the architecture of the entire system over and over and over again. So that was just shifting the attention to this being more of a hardware and software and operating system. That really what was the difference in bringing different attention to the products. And I think that that is, at the end, one of the things that attracted the friends in Boca Raton.

Fairbairn: Mm-hm.

Lanza: And we talked about this last time, I think. Our friends-- people in Boca Raton were attracted by the fact that we seemed to understand more about the entire view of the system than just the CPU itself.

Fairbairn: Mm-hm.

Lanza: And, in fact, the main guy that was talking to Boca Raton was Bill Davidow--

Fairbairn: Mm-hm.

Lanza: --which had clearly perfect understanding of how-- all the implications of the operating system, implications on the value of the architecture, the value of future compatibility from different products. And that's when we started talking about the future of the '86.

Fairbairn: Mm-hm.

Lanza: Then we started talking about the 186 and 286 and why the things were important. How did-- was compatibility important? How we're gonna move from an architecture that might not be the best-- we're gonna move to an understanding about what the need of the operating system was. We talked about memory protection, about segments. But just take the attention away from the intrinsic 8086 and show that the future was what we're really looking at and our future picture was definitely much better than what Motorola could ever even dream about.

Fairbairn: Mm-hm.

Lanza: That's why ww had more attention to the software. We were talking about the single-board computers. We were just looking at a much broader approach to the entire system, compilers. So, the entire thing was different. And that was the real essence of Crush--

Fairbairn: Right. Okay, so that was--

Lanza: --to take away the attention from the processor architecture. Because if you do attention on the 8086 architecture versus 68000 architecture, we stink.

Fairbairn: So that was-- Intel's obviously built its whole company on the microprocessor business. And this was a program that allowed it to not only maintain a position but grow its position and to cement its position as a microprocessor leader. So, let's pick up where we sort of finished off in the last discussion and you just mentioned the follow-on generations. What was next? And you mentioned the P4 and the P7. And the 386, I think, is the dark horse.

Lanza: Yes.

Fairbairn: So, step in there, and I guess you also made a transition to peripherals as opposed to processors. So, let's pick it up. Pick the story up there.

Lanza: So, what happened was when the-- when we won the PC, the entire attention moved from being able to have the full peripherals to being sure that we would have the evolution of the processor itself under control.

Fairbairn: Mm-hm.

Lanza: And we still had a much better general kit than Motorola could ever have, a much better developed system than Motorola could ever have. But we started paying a little more attention to the CPU itself. And that's why we tried to move it to the 386. And when we paid attention on the CPU itself, the issue was that the 286 was something from a computer science point of view people did not like. People inside Intel, people outside-- they were looking at this-- the segmentation was a little quirky. People liked more of a flat architecture and it wasn't flat. And the people liked more memory management unit à la Digital and that was more of a segment. So, the memory protection was a little bit overplayed. Truth is that the 286 was architect more based on the Multics architecture--

Fairbairn: Mm-hm.

Lanza: --than on the Unix architecture. And Multics was multi-segment-- a really complicated architecture. And from an architectural theory point of view, it was fantastic. From a simplicity and an understanding of a new generation of computer science, it wasn't. But we had gone that way, so now inside Intel the best computer scientists were puking on the 286.

Fairbairn: <laughs>

Lanza: They just didn't like it. So, I had to go more the flat way, whether it was flat and object-oriented or it was-- doesn't matter. So, somebody wanted the flat architecture on the P7, and the P4 was more like the 432. It was more of a segmented architecture. It was much broader. From a computer science point of view, they're much, much nicer than the 286, or the 386 was just an evolution of the 286. On the other side, we had a strong push for compatibility, and we could not abandon it. So, the dark horse of Mr. Lanza was trying to maintain this compatibility. And the other, from a computer science point of view, much more elegant and, frankly, something that the computer scientists were much more inclined to be associated with.

Fairbairn: The 432--?

Lanza: The 432 and the evolution before P7. They were much nicer. And from my point of view they were definitely much nicer. On the other side, from a company point of view, that was just abandoning something that was having a huge success. You don't do that! The thing is flying, you're not gonna jump off the rocket.

<laughter>

Lanza: Go with the rocket! So that was fundamentally the point, that very few people wanted to go with the rocket. Everybody thought it was better off if we dump the rocket than go and build another one.

Fairbairn: Mm-hm.

Lanza: I didn't think so and I did not have much support. So, at the end, they just changed the top of the microprocessor operation and the top was not really favorable to continuing. It was more inclined to tie themselves to the boat of "Let's have a better architecture. Let's have all the architectures supporting this." The architects were either internal from Intel or ? or they were ex-IBM people. So that's when I called Jeff Katz and I told him, "Jeff, I'm working for you." <laughs> He said, "Really?" "Yeah, really." And that's, by the way, when in Jeff's operation, he remembers that part pretty well, We're in Jeff's operation, we started thinking about the next generation of the kit. You remember that? I think we talked about that last--

Fairbairn: Yeah, we were just getting in that.

Lanza: Okay, so what happened is that we moved to Jeff Katz and I said, "Well, what we need to do the next generation of the kit." So we had done a SDSC controller, a controller for peripheral-- or communication. We had done a control for CRTs, and we had done a controller for disk. So, I said, "Why don't we look where these things are gonna go?" And we started looking at where is the disk going, and clearly the disk was gonna go more into this double density floppy and, probably in the future, hard disks. So, we said, "Okay, let's move in that direction. Let's be sure we do that."

Then we look at the communication, and interestingly enough on the communication side, what we saw was that that was gonna be the toughest one, because the communication standards were controlled by IBM and the phone companies. From a digital point of view, from a protocol point of view, IBM. From a physical point of view, the telephone companies. So that was a very tough one to try to break in. We had done the 8273 and the 8273 was an SDSC controller and, sure enough, after we had the controller, IBM moved the standard; it became an HDSC. We had to go back and reprogram. It was very heavily microcoded.

Fairbairn: Mm-hm.

Lanza: In fact, the floppy controller and the SDSC were on the same chip. Identical. Identical.

Fairbairn: Just programming.

Lanza: The only difference in the two was if you look at the serialization of bytes, if you're doing that on a disk, it's most significant [bit] first. If you're doing it on a-- communication is the least significant first, or the other way. I don't remember.

Fairbairn: Right.

Lanza: The only difference was that when you move parallel, from byte processor to bit processor, you have to shift. You have to reverse it. That's it. Nothing else. The two chips are identical with this exception.

Fairbairn: Mm-hm.

Lanza: So, it was a general controller whether it was a byte processor or a bit processor. So that was-- so we had done those. But the SDSC never flew. The HDSC was gonna be the same. What happened is

that we started the thinking, "How can we take control of the protocol?" I think we talked about this last time.

Fairbairn: I don't think so.

Lanza: How do we take control of the protocol? We did this and sure enough we-- it was obvious what to do on the disk, but on the protocol and on the communication, we started thinking how do we change this? So how do we do something that's not gonna go through the communication and the PBX?

Fairbairn: Mm-hm.

Lanza: Because we had 96 boards. It was ridiculous. So, we started thinking maybe we should just have a communication, the direct communication-- binary communication, baseband communication-- between computer and the next computer. So, we started looking around, who could do that? And clearly that was something that I was very excited about because my first job ever as a computer scientist was at the Olivetti General Electric. And what I had done there, my fundamental assignment was to do a serial interface between computers.

Fairbairn: Mm-hm.

Lanza: Highest possible speed at the time: twenty megabits per second.

<laughter>

Fairbairn: Pretty fast.

Lanza: Hey, fifty nanosecond clock. <laughs> So we defined the serial interface. It clearly was something-- in fact, I think it was a patent, one of them. And it was from GE, Olivetti General Electric. And so I thought it was a great thing to do. So, I talked to my friends at Olivetti, Mario Mazzone [ph?], in particular, and Luca Cavione [ph?]. I talked to them and said, "Well, what should we do here at Intel?" Well, also we were always exchanging views on how the future should go from a system point of view. And we just paid attention to some of the serial protocol that were coming down. But the one that really excited us was the one called Ethernet. We liked it because it was fast. It was ten megabits per second. And it was baseband and we understood it. So, it was just a fast shift-- finished! That's it!

Fairbairn: Mm-hm.

Lanza: And so we thought, "Well, maybe that's what we should do." We talked about that with Pullman, in particular-- Bill Pullman, and with other people at Intel. And they said, "Well, that's interesting. Let's see if we should go in that direction, this Ethernet." And we said, "No, but what happens here if we go Ethernet, well, the patents are with Xerox. So we need approval from Xerox." "Well, we want to do this. Let's go talk to Xerox and see if they're interested." And they said, "Well, you know, yeah, we're interested in talking about you guys developing a controller that would be the Ethernet controller." And so, it was great, Ethernet controller. So, we did that. And we said, "Well, why wouldn't the system company? Because we don't have a system credibility, and this is not gonna be just a chip. This is gonna be a chip, but, again, it's a system concept. Because if you do just the chip, we'll lose." So, we did write something that said, "We understand the system concept better," because the CPU is only five percent of the cost of the system. So _____end of the system. And we said, "Well, one thing, we'll talk to a system company." "Who is the system company you're gonna talk to?" I said, "Well, it's obvious: Olivetti."

Fairbairn: <laughs>

Lanza: "Let's go talk to Olivetti." So, we decided to do an agreement between bring in Olivetti-- so Olivetti and Intel and Xerox would just work together and define a standard serial interface protocol based on the Ethernet, which I mean had nothing to do with inventing anything. So I make that very clear. It made zippo. But we thought it was a good processor, a good protocol. It was baseband, so we understood it. We knew how to do it. It was not very difficult from a conceptual point of view. It was as fast.

So we went to Olivetti to see whether they were willing to work with us-- went there with Kaufman, Phil Kaufman. And went there and we presented a proposal for them to participate with us and they basically said, "Uh.. uh.. uh.. uh.. We'll give you an answer sometime in the future. We really kind of like it, but we don't know if we are the ones that-- we don't know. We are not sure that the '86 will do what we want to do."

Fairbairn: Mm.

Lanza: So we came back and remembered coming back on the plane with Phil Kaufman, we said, "What do you think the answer was?" And--

Fairbairn: So, Phil Kaufman was working for Intel--

Lanza: Microprocessor.

Fairbairn: Microprocessor.

Lanza: He was in charge of microprocessor operation. General manager.

Fairbairn: Oh, okay.

Lanza: So on the way back he said that-- he said, "What do you think?" And I said, "Well, I don't know." "Well," he said, "I want to know from you what you think because you are Italian, and a lot of the conversation was in Italian." And I said, "Well, but it's better if you tell me what you saw, because I was more into the details." And he said, "No way in hell they were gonna participate." I said, "That's a good way to put it."

<laughter>

Lanza: I said, "That jives with the details."

Fairbairn: Right.

Lanza: So, we came back and we said, "All right now." So, we wanted a system company, so what are we gonna do? And he said, "Okay, why don't-- who would be a good system company here?" And we said, "How about Digital?" I said, "Ah, Digital, they have their own protocol, DECnet, and I don't know." "Well, let's call Gordon Bell." So, we got on the phone with Gordon Bell and we told him we wanted the Ethernet and he knew everything about the Ethernet. And we said, "We need a system company as part of defining a standard." And he said, "Okay, well, we're in if Big O is out." And we said, "Well, Big O is out." "We're in." That's when the trio that defined became Digital--

Fairbairn: Right, Xerox--

Lanza: --Xerox and Intel.

Fairbairn: Right.

Lanza: And then was the point now of selling inside. Selling inside. It was an easy one to do, because I remember then we tried to sell it inside, the first question was, "How many installations of Ethernet exist?" And we said, "Two."

Fairbairn: <laughs>

Lanza: One at Xerox PARC and one at University of Hawaii, because a professor from-- no, a person-- a top technical guy from Xerox had to gone to the University of Hawaii and they had the two megabits per second version. I said, "There are two installations." <laughs> He says, "So we're gonna do an LSI for two installations." "Yep!" And it was a big political game inside to get it going. But Kaufman did a fantastic job. And the thing started flying. And the association that was pushing the standard was the Xerox, Digital and--

Fairbairn: Intel.

Lanza: --Intel. And if you look at many of the Internet companies that were started, they were started by Digital people that left <inaudible>.

Fairbairn: Mm-hm.

Lanza: So that was the Ethernet activity that came. And then one other thing we said was, "You know what? We understand how to do the controller, but what we're gonna do for the driver? We don't do drivers here." So that's when we called AMD and we asked AMD to participate in the standard and they would do the drivers. There was no fight again between Intel and AMD. We were still cooperating and, in fact, were still in a good cooperation mode, because IBM had forced Intel to discontinue any second sources in Japan in favor of AMD. So that's-- I told you that last time. That was a person-- that was the ambassador of Intel to convince AMD to second source the '86 was Regis McKenna.

Fairbairn: Oh.

Lanza: He was the one that went there and Jerry Sanders, when he was asked to do it, he said, "Well, I don't have a choice. That's the winner. So, I don't care about the 68000 anymore. I care about this." So that's what happened. And that is another big story. So anyway, that's how we ended up doing the Ethernet controller. And then we had those two-- and you remember we talked about this last time-- when we started moving to the controllers one of the things that we wanted to do is find-- we needed somebody to do the double density floppy. We needed somebody to do an SIO for the fight with Zilog.

Fairbairn: Mm-hm.

Lanza: And we took NEC as the company who would do it. I talked about this last time. And when we took NEC, the third chip that we did with them was the graphic chip. I remember talking about this last time. And the graphic chip became the first graphic controller, or the 82720 or-- I think it was the 82720. I think so. It was the first graphic controller.

Fairbairn: Mm-hm.

Lanza: And I think I gave you the entire story last time. So, we moved to this Ethernet development and the Ethernet controller was defined by Moshe Stark. And Moshe Stark was a person with Intel Israel that was working in the peripheral architectural team in Santa Clara and the Ethernet controller, the 82586, became the first chip defined by an Israeli team.

Fairbairn: Mm.

Lanza: It was, in fact, the first chip after that being designed from scratch in Israel. And it was a great move, in my opinion. And we were quite excited about it, and they did a fantastic architectural job. They defined the entire spec in higher-level language, software -- was in C. So, the entire description of the chip was done in the very modern fashion. Moshe did an incredibly good job. So that was one of the big ones that we did when I moved to the peripherals.

And the other things we did there was we wanted to move up also from a software point of view, so we did a kernel for the operating system. It was compatible with the RMX 86. And the person who was in charge of doing this kernel was Ann Doerr, who was--

Fairbairn: John Doerr's wife.

Lanza: --wife. She was working for me doing this in the peripheral team. So we really tried to do something that was gonna be a far bigger set of peripherals than anybody would ever dream about. So, from an operating system to graphics to a communication control. I thought that was something that Jeff and I worked on and we were definitely very excited. We felt we had really taken control of the evolution of the kit. And that had, to us, had an important aspect in the way it would end up evolving the entire image of Intel from being just a component company to being the company that understood the system aspects.

Fairbairn: Right.

Lanza: And we thought that was very important because we knew that Motorola knew nothing about it. So, if you really want to win a battle and you know you're gonna lose in this battlefield, you make the battlefield bigger.

Fairbairn: Right.

Lanza: And you fight it that way. So that's fundamentally what--

Fairbairn: So how long did you remain in the peripheral group?

Lanza: I remained in the peripheral group for about two years until 1983-- I think was '83, end of February. And that's when I decided to leave.

Fairbairn: Leave Intel.

Lanza: Yeah. I had decided to leave a little earlier, and Les Vadasz convinced me not to do it. And I still have-- I saw this a few months ago. I still have a little note, sticky this big, from Les Vadasz, and when I had resigned-- I had wrote, "I don't think I can contribute as much here. I really want to do something new," and I was gonna join a company that Phil Kaufman had become the CEO of. It's called Silicon Compilers. So, "It's time for me to join Silicon Compilers." Les Vadasz called me and he asked me why I was doing it. I told him why I was doing it and that I really loved Intel, which I did. I really loved it, but I felt like it was just-- I didn't feel like I could contribute as much as I wanted. I was excited with architecture. I was excited with working with Jeff Katz. I was excited about all the stuff we were doing there -- with serial interface, the Ethernet. All these things. The new generations-- what we called new generations of memory management. There was a lot of stuff I really, really liked. And one thing I really liked was, again, the new generation of memory management that was something that I thought was very important, that was really tying into the Ethernet controller.

Fairbairn: Mm-hm.

Lanza: And how you move up one level in terms of the segment management or memory management of higher level of interface. And Ethernet was fitting into higher-level protocol of-- so just a very nice way of moving to system level.

Fairbairn: So you just gave your reasons to leave Intel in terms of wanting to do something broader.

Lanza: Yeah.

Fairbairn: What was the draw on the Silicon Compiler side? Was it Phil Kaufman, you knew him and so forth?

Lanza: I liked what they were doing and they were looking-- Silicon Compilers, to me, was doing one level higher and innovating in terms of doing a software that was designed to take advantage of the

underlying hardware. So, the fact that you had this software taking advantage of the segmentation, the software-- it was really bringing up the architecture to a level where your software would be different. So, I thought it was really having a bigger impact on the industry. And Vadasz convinced me that I had much bigger future at Intel than in any start-up.

Fairbairn: Mm-hm.

Lanza: But he also knew that I was upset. Fundamentally, I was upset because I was not in the processors anymore. So, let's call it by name. I love to do processors and as much as I was excited about doing Ethernet-- it was very exciting, but I--

Fairbairn: Just not the same.

Lanza: Wasn't the same. And so, he gave me this note and in the note, on the bottom, there was a turkey. And it said, "Don't let the turkey take you down."

<laughter>

Lanza: Turkeys take you--

Fairbairn: Turkeys. Okay.

Lanza: He gave me that. So I looked at that, I thought about it and I called him and I said, "I'm not gonna let the turkeys take me down." So I withdraw the resignation.

<laughter>

Lanza: And we worked some more on the peripheral team for probably another nine months or maybe--

Fairbairn: So you never went to work for Silicon Compilers.

Lanza: No. I didn't.

Fairbairn: I couldn't remember that.

Lanza: The person that wanted me to go there other than Phil Kaufman was John Doerr.

Fairbairn: Okay.

Lanza: John Doerr was the one that was trying to convince me.

Fairbairn: Right. By that time, he was a venture capital person, right?

Lanza: He was venture capital and he was the-- for some time, he was the acting CEO of Silicon Compilers. We were really very connected into Silicon Compilers. It was him-- Ed Cheng was there and a couple of people from down in Southern California.

Fairbairn: From Caltech, yeah.

Lanza: Or Caltech yeah.

Fairbairn: Dave Johannsen?

Lanza: Yeah. Yep, yep. So it was a great team. I really liked it. So now I stayed back, stayed behind. And then what happened is that my friends from the architectural team in Intel, some were friends, had left. Aryeh Finegold left. Aryeh Finegold was working for me. And he was working with me on some of the various projects in the Intel architectural team. In particular it was some high-level language compilers and stuff. He worked with some of the serial interface. He was a really strong mind, incredibly strong minded guy. We worked very well together. We're very good friends. Very good friends. We're gonna probably be having-- he was my best friend when I was alone here.

Fairbairn: Mm-hm.

Lanza: And he had started Daisy with Dave Stamm and he kept asking me to join. And at a certain point I looked at what I was doing, I looked at what they were doing; I liked what they were doing. So I decided that I would this time resign and go. And this was end of February in 1983. So actually, this time I give the resignation and I stayed there only-- the last thing I wanted to do was be sure that we would get the cover of "Electric Design" for a chip that we were announcing--

Fairbairn: <laughs>

Lanza: --which was the 82730, which was the CRT controller for very high-speed CRTs.

Fairbairn: That was a big thing in those days, is to get the cover of "Electronic Design" or any of the-- "Electronics" or "Electronic Design", right? That was the ultimate goal for a marketing manager or whatever.

Lanza: So, I got the cover. I went on the road show with various places to _____. I got "Electronic Design" to accept it, and then the resignation was effective, and I left. And I left at the end of February, first week of March. And I joined Daisy Systems.

That was interesting because when I joined Daisy Systems, Aryeh Finegold said, "You know, you're joining in-- you are in a very strong marketing position at Intel. We cannot give you-- what can we do here for you? You know, I know you." Aryeh used to work for me, "so I'll come here, work for you. It's okay. And I know that you have very strong people, very strong mind and I don't want to be in charge of anything. So I'm gonna come here and my philosophy is that you're gonna have to earn your stripes in the army you join. The stripes from the previous army don't necessarily count. So, I'm gonna join in with no stripes. I'll earn them."

Fairbairn: This is Aryeh talking?

Lanza: No, I told him.

Fairbairn: Oh, that's you-- you told him. Okay.

Lanza: Because he's a military guy. So--

Fairbairn: Yeah, so I was gonna say. He's an Israeli paratrooper or something, right?

Lanza: And he understood that, and he absolutely bought into that. So, I said, "I'm going to earn my stripes in the new army."

Fairbairn: Army, right.

Lanza: I said, "Okay. So what do you want to do?" "Well, can you hire me as a customer marketing engineer, level zero? So I'm gonna be here and work with you on how you can address customers and understand what customers want and have the best offering for customers." "Okay, now you're a

customer marketing engineer." Good. So, I got there. I got a demotion in salary. And I joined as a customer marketing engineer. And I started working on doing that. Then I had--

Fairbairn: Did they announce the product at this point?

Lanza: They had announced the first Daisy workstation. Okay? They had a few customers. I don't think they had very serious customers. I'll tell you in a second why I'm saying that. The first customer they had was Data General. Data General happened to have as their main board member the largest investor in Daisy--

Fairbairn: Hm.

Lanza: --which was Fred Adler.

Fairbairn: Which was who?

Lanza: Fred Adler.

Fairbairn: Oh, Fred Adler. Right.

Lanza: And so, I'm not sure that there had many more customers and I'll tell you later why I'm saying that. And so, I joined in and it was very interesting because I was very excited about what we were doing. And they put me in charge of PR. So, the first thing I did as a customer marketing engineer-- did not have very strong PR-- they asked me to do some work because we were having a visit to Daisy Systems from President Reagan.

Fairbairn: Oh, jeez.

Lanza: And the reason for the visit is that before my time, they had convinced President Reagan in his speech in San Francisco, and he was talking about why the Valley was important--

Fairbairn: Mm-hm.

Lanza: --to mention some start-ups. They were really the key to show and point out the success of the Valley and why the Valley was so important and why innovation was so important. And one of the companies he mentioned was Daisy Systems. That is a start-up in the Valley, and they are already have

customers all over the world. They have customers in Israel, which was true. They are-- they're one of the most important companies-- <laughs> they talked about that.

And the point is he was gonna come and visit Daisy Systems-- I think it was March 4th, if I remember correctly. So, we were all excited. They were all ready to have the visit. And we just-- and we were in this building, which was-- we had just moved in one floor and <laughs> the building was much bigger than the size of the company. We had to structure everything so when he would come in, by code, we would say, "Well, now we need to do this," people would move from one area to the other <laughs> so the cameras would not find empty space. <laughs>

Fairbairn: These were all the cubicles that were unoccupied?

Lanza: <laughs> We were just moving everybody. So everything was well organized. We're gonna do it. We're all excited about it. And, sure enough, we had a flood and Reagan could not come to Daisy Systems and they just did not come. So, the entire preparation didn't do really much, but we still were asked by-- since he mentioned us, a lot of people came there to talk to us. We were put on the map by Reagan's mention.

Fairbairn: Right.

Lanza: And I was very excited, because that really meant a lot for the company. It meant a lot for me and I was in charge of customer marketing engineering at this point and <laughs> I was the only customer market engineer. It was me and the PR lady, Michelle Prada. That was it. There was nobody else. But that was an interesting way to get introduced to Daisy Systems.

And just to make a long story short is-- but if I remember correctly, three months later things started moving around and I became the person in charge of marketing. So I moved between three and six months-- I don't remember exactly-- I became the VP of marketing, because Harvey Jones moved from VP of marketing to a position where he was in charge of the development of the first chip-- of the first CAE workstation for the design of chips, not for design of schematics.

Fairbairn: Right.

Lanza: It was just the layout. So from Gatemaster-- there was one we'll talk about in a second. So from Daisy workstation to Chipmaster.

Fairbairn: Mm-hm.

Lanza: It was Daisy, Gatemaster, Chipmaster. Now the Daisy--

Fairbairn: Daisy was your first introduction to electronic design automation.

Lanza: Yeah.

Fairbairn: Yeah.

Lanza: And Daisy would've just started. I mean we can talk about 1983, end of February.

Fairbairn: Yeah, that's when-- yep.

Lanza: There was a smaller company called Vallid, but Valid was not really flying. There was nothing else.

Fairbairn: Right.

Lanza: So we really-- I remember that I think Harvey Jones invented the CAE workstation, if I remember correctly. And so I was lucky enough to become in charge of marketing and we started doing really a lot of stuff. Then I had some people out of Intel. I had Tony Zingale. I had Jay Rampazzo [ph?]. We started really building the team.

Fairbairn: Mm-hm.

Lanza: And that was an interesting time because it was the first time that CAE   workstations-- that's what they were called-- and therefore the design of chips would be done outside of-- it was with an outside--

Fairbairn: Right.

Lanza: a semiconductor company for real.

Fairbairn: Right, right.

Lanza: The previous one was Calma--

Fairbairn: Applicon.

Lanza: Applicon.

Fairbairn: Computer Vision.

Lanza: --and Computer Vision. The real one that was strong was Calma.

Fairbairn: Right.

Lanza: Intel had Applicon because they wanted to balance the two. But Calma was the real leader. It was just political pushes. There was not much more to it. So, what happened is with Daisy taking more of an approach of design at gate level and schematic entry, we thought that we could become the next level and Intel will really buy into that. But as often happens the last company to buy into an innovation in design style is the company that leads.

Fairbairn: Mm-hm.

Lanza: They're leading. They know how to do things that way.

Fairbairn: Right.

Lanza: So they're not gonna do it. Dave Stamm and Aryeh both knew very well how to do these things. Dave Stamm was the only user of Applicon with the 186 architecture. In their boxes, the architectural one is the big box on 186, the big book on 186.

Fairbairn: Oh, okay, great.

Lanza: I'm gonna ask Intel whether we can have it here.

Fairbairn: Okay.

Lanza: It's huge, but it's nice to see how we were defining things in those days. I'm gonna call and ask-- I hope no one will get mad. <laughs> But David Stamm was very strong from my archi-- he had designed

the 8048 initially. He was right out of school, out of Purdue. He had designed therefore the 8051 after that and after the 8051 he was in charge of the 186.

I was the architect and he was the designer on the 186. So Stamm and Finegold knew very well how to do these things, but it was very difficult to convince a leader to change their methodology. And today it's obvious, in those days, we didn't know. We thought really, we're old friends of Intel; they will do what we're saying; they understand we understand it. We're not out there trying to do exactly what they're doing in Daisy Systems. They're trying to do it inside.

But, you know, it was no-- by the way, Daisy Systems, the name came out of the fact that we-- Aryeh, not me. Aryeh wanted to do something for-- Aryeh's wife wanted to do something that was very familiar to people. And the thing that at the time they thought was very interesting was how successful a company called Apple was.

Fairbairn: <laughs> I was just thinking of that analogy.

Lanza: And they said, "Well, what can be a flower, that's simple, that's obvious, that's natural as a daisy? So we'll call it Daisy Systems."

Fairbairn: <laughs>

Lanza: That's where it came from. At the time it was pretty aggressive because the daisy-wheel printers were the fundamental printers.

Fairbairn: Yeah.

Lanza: So calling something Daisy Systems-- very confusing.

Fairbairn: Yeah and in relatively the same marketplace.

Lanza: Correct. So we were very nervous. What are you doing? What is this?

Fairbairn: Mm-hm.

Lanza: So anyway, I end up getting very strongly on the marketing side and at the time it was interesting because one of the things that Harvey Jones was very strong on, was working on, was a product called Gatemaster, which was an ASIC product.

Fairbairn: Mm-hm.

Lanza: And Harvey, principally, more than me, and I looked at the CAE workstation market and we just said, "You know, we just cannot break into Intel. It's very difficult." The only place where we break in is when people design ASICs. So, Motorola is using us, National is using us, a lot of CDI is using-- you know CDIs--

Fairbairn: Yeah, California Devices. Yeah.

Lanza: Yeah. But somehow the large chip companies are not using us. And Harvey said, "Now we should learn." So he said we should just learn the lesson and do what people are telling us. And he had the idea of shifting the center of attention from designing schematic entry for chips, for custom chips, to gate arrays. And I jumped on it and I decided-- we decided I would be the one target. Not my intuition. His intuition. My execution. So, I took that and I talked with Tony Zingale. We talked about it. We said, "Yeah, we can do this. We're gonna do this." So-- and we started working on this. It was so exciting because "Hey, let's look at this thing." If you really think about it, how big was the ASIC market?

Fairbairn: Very tiny. It hadn't--

Lanza: Very tiny!

Fairbairn: It hadn't even been called ASIC by then hardly.

Lanza: It was really, really tiny and you had Motorola that had two families, was the 600 gates and the 1200 gates--

Fairbairn: <laughs>

Lanza: --going into the twenty-four hundred gates.

Fairbairn: Right.

Lanza: And you had all these new companies that, yeah, they were there. Gee, do you really want to base the future on these things?

Fairbairn: <laughs>

Lanza: But what happened is we realized that we had a big advantage there, fundamentally, because we had some of the best and easiest to use tools. You look at Gatemaster. Why was it easy to use? Well, because-- this is laughable-- it was the fastest thing you can think of. I mean other people, you move gates into this. You do GateMaster <makes whooshing sound>. Nobody knew how we did it. How did we do it? <laughs> Well, we had designed, at Intel, the 82730. 730? Yeah, I think-- don't quote me.

Fairbairn: We'll check later.

Lanza: Check-- it was the controller for the character graphics.

Fairbairn: Mm-hm.

Lanza: So, what we did, a gate was a character. So, we could move gates as fast as you would--

Fairbairn: Move characters.

Lanza: As long as you have the buffers, and in the buffers we had gates. And you have connections. So it was a set of character graphics. So it was as fast as a word processor. Because the 82730-- that's what it was called-- the 82730-- I think of it now, the 82730 was a character graphics thing. So as long as you define characters in a way that the gates look like characters, it was as fast as that! That's what _____. Whoosh!

Fairbairn: Was there a limit on the size of the gate representation to--?

Lanza: Of course! Why not?

Fairbairn: <laughs>

Lanza: But we got to design our own gates and we just-- we would enter their family.

Fairbairn: Yeah.

Lanza: So they can say, "Here are our gates." "Oh, we enter for you." So "We do it for you." So, nobody needed to know that, nobody even knew there was a character graphic. What it was was a word processors showing gates. I don't think anybody knows it today.

<laughter>

Lanza: So that was <laughs> Oh, yeah. There was another one. Could be 275. I don't remember. It doesn't matter. We kept the 75 end [ph?]. So it was a very interesting thing. So now we were the best in doing gate arrays. We could do it really fast, we would enter the gate arrays ourselves. And so we decided, "Why don't we just go out and find out how many gate arrays we can get in?" So we did this for everybody--

Fairbairn: How many libraries.

Lanza: Libraries, yes. Get them in as fast as we can. So, we went out, Tony and I, and we went to various companies to just enter these things and convince them to let us handle their stuff. And we would do a job for them. We would get the libraries in. We knew it was not a very exciting job. So, we do that job. We do it for them.

Fairbairn: Mm-hm.

Lanza: And we went around doing this campaign, getting as many as possible to accept that we want their things and therefore it would be easier for them to go get customers. And so this gate array program went on very quickly. Tony and I were out doing the presentations and at a certain point we thought we had enough, so we came out with an ad that said, "When you are looking for a CAE workstation, ask yourself 'How many libraries does your workstation support?' In Daisy's case it's twelve."

Fairbairn: <laughs>

Lanza: Mentor had two. So we just blasted it off. So we positioned the company as the way to design very easily, very simply gate arrays. So Gatemaster was a piece, but in general the fact that we had now simulation, we had the entire thing, Gatemaster, the-- in a sense, the gate array was the entry point.

Fairbairn: Mm-hm.

Lanza: We repositioned it completely. And we surprised-- took everybody by surprise. Everybody. We were surprised ourselves by how successful the thing was. It wasn't for the fact of the Gatemaster itself, it was the fact that if you are doing gate arryas, we give you the libraries. We've entered the gate array and now from there on, you're in. Now you can use these things that when design chips you don't want to use. But if you are coming in, and you don't have a previous expertise, a previous way of doing things-- so we went to people that were doing new designs and were mainly system designers or the gate array side of a semiconductor company, we went on to market that way.

That's how we blasted through the market with Daisy Systems. So that's what happened. And then what happens also since system designers are the ones talking to you, the inputs you get are very different than if you are designing chips. So that moved us very quickly in the direction of simulation and the direction of higher level…

Fairbairn: Right. At a higher level

Lanza: --and engage at a higher level. So, we could move incredibly quickly. We had the market, okay? The key when you are-- Intel taught me this, nobody else. The key, when you are ahead of the game, I use to say with-- with Pullman, "You know, the key when you are on the tip of the iceberg is to understand you're on the tip of the iceberg. And you are there so you are--" I used to say, "We don't realize that we are probably a year ahead of everybody else, but they are five years behind."

Fairbairn: Mm-hm.

Lanza: Because we're getting the inputs. If we do something wrong, who are they gonna complain to? Us. So as long as we listen, we're gonna be able to increase the lead.

Fairbairn: Right. That's right.

Lanza: So we need to be on the tip of the tip of the tip.

Fairbairn: Right.

Lanza: And keep moving fast. So that's what happened. And now the designers of the new generation, the designers of the chip, other than the existing leaders in designing complex chips-- Intel or, at the time, Motorola-- would just come in and define the methodology. As long as we listen to them very quickly, we're gonna move.

Fairbairn: Mm-hm.

Lanza: That's why we led in what? We led-- what did Intel-- what did Daisy really led was-- this simulation was the first simulation ever. The acceleration, the MegaLogician-- the MegaLogician was unbelievable. People could not believe it. What the-- the MegaLogician was fundamentally taking the simulator and make an accelerator for the simulator, knowing the architecture was three processors in sequence-- one was the reading, one the execution-- in three complete processors. And as a result, the Daisy simulator with an accelerator would be hundred percent faster, hundred times--

Fairbairn: Hundred times faster.

Lanza: Hundred times faster.

Fairbairn: Right. Yeah, I remember the MegaLogician was quite a success.

Lanza: It was unbelievable. I remember when we presented this to a users' group of Daisy Systems, we presented it and they were there. We said, "We have a new product coming. It's called MegaLogician. Let me show you why it's important." So, we showed the simulation. Let's take this—circuit with this. Let's do a simulation. Let me start it. Poom! They started the Daisy logic simulator. So, they started, and the simulation goes on about twenty seconds-- "Here are these! Here are the waveforms." "Oh, yes, it's good. It's faster than that. Yep. Let's try the same thing with the MegaLogician." We said, "Okay. Here's the same input. Let's start." Poom! The audience-- the auditorium came down with applauses. People couldn't believe it. It was a fraction of a second versus the twenty seconds.

Fairbairn: Yeah.

Lanza: They absolutely could not believe it. It was an unbelievable success on the MegaLogician as an accelerator. And that was Gary Catlin-- was always doing-- a very strong graphics guy in the industry. Incredible. Incredible. Great guy. Ex-Intel, of course. So, we did the MegaLogician and, clearly, the company was really taking off. There was nobody-- nobody could compete at the level we were at in those days. In a sense we are our own worst enemy because we were moving so fast that it was impossible to be able to deliver everything we would promise.

But sometimes the philosophy of the Dave was, unfortunately, was to overpromise. The philosophy wasn't mine, but the philosophy was "I would rather overpromise and have the customer mad at me, so I can fix it, than not promise and have the customer mad at somebody else, 'cause I cannot fix that." <laughs> The other customer will do well. But then we got completely spread very thin, very thin. So that was-- but that experience was incredible.

So, in two years I ended up moving from customer-marketing engineer-- the expression I use when I joined Intel was-- when I joined Daisy from Intel-- was when you join a new army, you throw away your grades. Your stripes don't count. You start at the bottom. And then I ended up being the general manager of their CAE product line.

Fairbairn: Mm-hm.

Lanza: And Harvey Jones was the general manager of the Chipmaster. He was always incredibly powerful in the way he would intuit the market. Incredible. I learned more from this kid. He was fifteen years younger than me, than from many of the other people I've been working with.

Fairbairn: Mm.

Lanza: But it was great experience, I think. It was three years, 1983 to 1986, with Daisy. And I think we did impact a little bit the way designs were done. There's tons of stories there. I'm gonna show you a couple of things here. Can you pass me that big box? It's a-- I'm gonna send you a copy of these. So the big box here has-- this was the--

Fairbairn: No, I'd like to capture it on the tape actually.

Lanza: This was the spec on the 186.

Fairbairn: Oh my gosh, handwritten specs.

Lanza: <laughs>

Fairbairn: So this is going back to Intel times. This is the spec of the 186--

Lanza: Yes.

Fairbairn: --all carefully cataloged and done by hand--

Lanza: Yeah.

Fairbairn: <laughs> --as things were done those days.

Lanza: These are-- I'm gonna send you a copy of these.

Lanza: There are copies of interesting articles. This is an article from an Italian magazine--

Fairbairn: An Italian Magazine called "California Qual-- Europa". It's about California.

Lanza: "Trip into the future".

Fairbairn: "Trip into the future, California". Wow.

Lanza: We were 1984. Mid-84. And it's interesting because he's talking about a lot of things. And here we see things like this. You know who this guy is?

Fairbairn: I recognize his face, but I don't remember his name.

Lanza: This guy?

Fairbairn: That's An--?

Lanza: Uh.. This is--

Lanza: This is not him. Let me get-- there's one I want you to see. It's-- well, someone here there is a picture-- the other one-- a picture of Jim Ready.

Fairbairn: Of Jim--?

Lanza: Ready.

Fairbairn: Jim Ready.

Lanza: Mm-hm. You know who this guy is?

Fairbairn: Is that Lucio?

Lanza: That's Lucio.

Fairbairn: <laughs>

Lanza: You know what that building is?

Fairbairn: You were standing on top of what--

Lanza: Daisy building.

Fairbairn: Mm-hm.

Lanza: Before Daisy building was built. This is the Daisy building where Synopsys is now.

Fairbairn: Oh, okay.

Lanza: Yeah. On the next _____.

Fairbairn: This looks like Curt Widdoes.

Lanza: Yeah.

Fairbairn: And do you know who that is?

Lanza: No, but these are two Valid System guys.

Fairbairn: Yeah.

Lanza: Yeah. This is the screen with the character graphics.

Fairbairn: Okay.

Lanza: These are word processors.

Fairbairn: Right.

Lanza: That's the Gatemaster.

Fairbairn: This is the--

Lanza: So that's one and the same one is here. The same picture.

Fairbairn: The same picture. Yeah.

Lanza: And here I think is--

Lanza: Somewhere in here is the picture-- doesn't matter. That's okay. Somewhere here is the picture of Jim Ready. When I find it I'll send it to you. And so, these were magazines, and this is interesting because-- this is another magazine. This is one--

Fairbairn: These are all Italian.

Lanza: That's another--

Fairbairn: That's another Lucio picture.

Lanza: Yeah, that's the Daisy Systems.

Fairbairn: That's what Silicon Valley is all about. That's great.

Lanza: So this--

Fairbairn: Yeah, so I would definitely like to get copies of all this.

Lanza: So these are-- this is another one on why the research is important here, but I have tons of those. But it's interesting that-- what was happening in those days is that people in the world understood that Silicon Valley was moving incredibly fast. I mean we are talking this is '84.

Fairbairn: Mm-hm.

Lanza: Maybe-- either-- no, '84 for sure. No, either '84 or beginning of '85.

Fairbairn: Mm-hm.

Lanza: And people from Europe would come and talk to us, try to understand what we're doing, how we're doing it.

Fairbairn: Right.

Lanza: And I remember people from Italy coming there. I remember one guy that was in charge of the Italian unions-- the second largest union guy was a socialist and communist-- and they came here and was trying to ask what should they do in Italy to finance and help Italy gain somehow a position in this market? And what can the government do to help Italians to do this? And he asked me, "What do you ask the American government to help you? You ask people here, what do you ask them to help you? I'm sure you ask them." And I said, "Yes! I don't have the power to ask them anything. But if I had the power, what I would ask them is 'Stay out, stay out. Let us go on. Don't stop us. Don't come in. Don't organize anything. Let us do, because we will win by virtue of not being taxed and stopped by getting distraction of what to do.'"

He looked at me like, "That's impossible. We obviously want the Italian workforce to work on these things and we're gonna help them." "Oh, yeah, well, that's, Mr. Benvenuti," that was his name, "that's why I left Italy." <laughs> And the guy that brought him in was a guy that was the assistant to the consul in San Francisco, the Italian Consul, and we had a lot of those activities. It was very, very interesting times.

And, to me, Daisy wasn't just a company that was innovating. It had an incredible energy. If you look at how many companies have been started by-- people used to ask me, "How many companies w--" in fact, Italian guys-- "how many companies are started here? Why doesn't the government help you?" I said, "You don't understand. Companies here are started by the energy of people that are self-driven. And look how many companies were started by ex-Intel people." Hundreds. And look how many companies are started, say a few years later, by ex-Daisy people. Unbelievable energy. Unbelievable energy, in particular, Daisy. We had some of the most aggressive, driven Israeli people in Daisy and some of the best Daisy customers was-- when I mentioned that earlier-- one of the best Daisy customers was Eli Harari.

Fairbairn: Was which?

Lanza: Eli Harari.

Fairbairn: Eli Harari, yes.

Lanza: And at the time-- oh god, what was the name of the company? Uh.. it'll come to me. But he was one of the first customers.

Fairbairn: Mm-hm.

Lanza: And he was a strong user of MegaLogician. And he was really incredibly helpful. Waferscale.

Fairbairn: Waferscale. Right. Okay.

Lanza: He was incredibly helpful to Daisy. Really, really good for us.

Fairbairn: Okay. So let's get back to your story here. We're only up to 1986, right?

Lanza: Yeah. <overlapping conversation, inaudible>

Fairbairn: And we've still got twenty-five years to go or something <laughs>

Lanza: 1986. <laughs> So in '86 I was happy to be in charge of what ended up being about eighty percent of Daisy System business. And I was incredibly excited, and I was hit by the bug over starting my own. Something that Fred Adler told me the day I joined Daisy-- he interviewed me-- and he said, "You're gonna come here and I don't think you're gonna be here more than two or three years. 'Cause by then-- I know you: You will decide to do something else," which I did. And when I told him I was doing it, he said, "Yep. I expect it. Not new news." So, I left, and I thought that what I would do was look at the industry and try to make the next generation of design automation companies easier to do. I felt the best way to do that was to develop a fundamental frame for how to connect design tools. And at that point we had moved the name of the CAE workstation from CAE workstation-- we started using the term EDA system.

Fairbairn: Mm-hm.

Lanza: But we were not yet done yet. So, I decided that I would start a company called EDA Systems. And EDA Systems would do systems that were fundamentally software backbone or software framework to put together tools. So, it would be very easy for designers who are not expert in the computer design

software, but are more system expert, to design these things and just do the framework. You want a tool that does design entry you can plug it in. So you had tools plugging in--

Fairbairn: So you'd buy the actual tools from another vendor, but you would plug it into your framework.

Lanza: Correct. That's exactly what I thought we would do.

Fairbairn: Right.

Lanza: And in order to do that you had to be independent from any company and you just try to do that. And so we developed a pretty-- I thought it was a pretty good set of frameworks. We had some companies, very, very, very strongly supporting us, Motorola, in particular. Ford Motor was a strong supporter. We had a few very, very strong supporters who-- this kind of--

Fairbairn: Mainly the user companies. The companies that would benefit from it.

Lanza: Yep, users' companies. And we were really excited. So we did that. It was a fundamentally software framework. It was an object-oriented software framework and you just insert the various objects and we just manage them. We were a little ahead of our time. So, what happened was that we did find a few companies that were really excited, but people did not feel like they could have somebody else between them and deciding which tools to use.

Fairbairn: Right.

Lanza: And from that point of view, it was a good intuition, too early as an idea. We had strong support. We had very strong support from Motorola, support from National, support from many companies. But at the end we had the support of many different gate arrays, but we just wouldn't fly as strong. We worked what was called a Framework. At the end, my view of this, when I was trying to get new financing and the view of the main financing parties were a little bit at odds. So, we decided we'd part friends and they brought in another CEO, and I moved aside. And when I moved aside, I decided I was gonna just do a few consulting contracts. So, I talked with my friends at Olivetti and "Oh, yeah, we would like you to just help us design our interface with the CAE systems."

Fairbairn: Mm-hm.

Lanza: "We want to be able to be very productive with designer chips. And so, yeah, we would love to have you work with us." I said, "All right." Then I called Joe Costello and--

Fairbairn: Joe Costello at Cadence. Mm-hm.

Lanza: Yes. I said, "You and I--" I didn't remember Cadence name. I was there-- yeah, it was SDA Systems. I go, "You know, you and I have been kind of competing on each other's throat, but I left Daisy. I left EDA Systems. Maybe we should talk?" "Sure. Let's talk." So, we met. And I said, "Yep, I'd like to work with you." Joe-- "Come here, let's talk what we can do." And we-- so he said, "Ah, let's-- come here. Help us do these things." So a couple of consulting contracts and then a company called Dillon Read said, "You know, we are interested to see whether-- this could be an interesting guy here. Come here. Let's talk and see." I went into Dillon Read and there was Eli Harari!

Fairbairn: Pardon?

Lanza: Eli Harari. It was--

Fairbairn: Oh, Eli Harari. You said Dillon Read was the company?

Lanza: Yeah.

Fairbairn: What we they invol-- they were financial--

Lanza: They were venture capital.

Fairbairn: They were venture capital, right.

Lanza: It was side business. Small-business venture.

Fairbairn: Okay.

Lanza: And the other guys there, one guy just joined… his name was Irwin Federman--

Fairbairn: Oh. <laughs>

Lanza: <laughs> So I joined just as, what do we call it, kind of entrepreneur in residence. And there are two VCs that were interested in talking to me. One was Bill Davidow and the other one was Irwin Federman. I had to decide where to go. And in the end, I decided I'm gonna spend some time with Irwin

Federman and Dillon Read. So, I was spending some time with them, and at the same time I was spending some time with Cadence Design Systems. By now I think they changed name because they'd failed completely in taking public-- anyway, I think by now they had already done the connection with the ECAD <overlapping conversation, inaudible>

Fairbairn: Yeah, because ECAD was public and SDS wanted to go public but it was on Black Monday or--

Lanza: Correct. That exactly--

Fairbairn: --and they couldn't go public and so they ended up combining as a way to become public through the combination.

Lanza: Through the back door. Through the back door. Yeah. So, they joined with ECAD and I ended up being a strong advisor to Costello at that point on the thing he was doing. So, I ended up having this situation, which I said, "I don't know what to do--"

Fairbairn: So this year was--?

Lanza: 1989.

Fairbairn: '89, okay.

Lanza: End of '89. So end of '89 I decided I would do for a couple of months just trying to decide what to do with my future.

Fairbairn: Mm-hm.

Lanza: I liked what I'd learned about venture capital. I liked what I learned in terms of looking at the future in the industry. I'd done that for Daisy. I'd done that for Cadence, I'd done that for Oli-- for Ethernet and for Olivetti. Well, maybe I should stick-- stay back for a second and see what I want to do. I thought I would do that for a few weeks, which I did. And then what happened is that the Dillon Read main partners, which were Phil Young and Irwin Federman, left Dillon Read to join US Venture Partners, which was in deep trouble.

Fairbairn: Okay.

Lanza: So they became managing partners of US Venture Partners.

Fairbairn: Right.

Lanza: And they asked me to join in as what would be called today an entrepreneuri in residence.

Fairbairn: Right.

Lanza: But they knew that I had other activities, so I would be part-time. So as long as it was reasonable and a reasonable time and no conflicts, they were very happy. So, I said, "Okay, well, I'll be a venture partner with you guys." They were not doing venture partner-- "I'll be partner with you," and I would be working with Cadence and other activities. Other activities of similar value and a few other consulting contracts.

It ended up being working with Cadence and working with them, which I thought was gonna be something which would really be a good thing to do for a few months while I decide what my future will be. To make a long story short, I ended up doing this from end of '89 beginning of '90. I did this for five years. And-- for four and a half. So, I ended up being entrepreneur in residence, if you want for US Venture Partners. I had tons of investments and I ended up being senior VP of <laughs>--

Fairbairn: Strategy, or whatever, at Cadence.

Lanza: --strategy at Cadence at the same time. So, you know, I thought one full-time job is a lot. Two full-time jobs? Well, twice a lot. I did that for some time. And I really liked it. I had this incredible view of the market and the future with my Cadence activity. And I had more dimensions that my brain could really space around, and not just in a narrow way, with the USVP investments. So, I ended up very excited to move-- of the dual possibilities. And at Cadence we ended up-- I think we did thirteen acquisitions when I was there. So I was in charge--

Fairbairn: Including Redwood Design Automation. <laughs>

Lanza: Including Redwood-- you remember well. I was there to invest.

Fairbairn: Yes, absolutely. I think you were-- I credit you with the decision to do that. You had driven the Comdisco investment before that, right?

Lanza: I did Comdisco investment. I had driven the investment in bringing in the company for the acceleration of video processing. So, a lot, lot, lot of different companies. We ended up working very hard. The key that we were doing with Cadence-- Cadence had-- Costello had this idea that it would grow by acquisition. It was the right idea.

Fairbairn: Mm-hm.

Lanza: Absolutely the right thing to do in-- you could not at the same time drive and follow the incredibly fast evolution of the design methodology--

Fairbairn: Right.

Lanza: --and design new things.

Fairbairn: Right.

Lanza: So, you had to find who was winning in the new things and bring them in.

Fairbairn: Right.

Lanza: And be sure that the customer you had were happy. In order to make customers happy, you have to continue helping them--

Fairbairn: And supporting them.

Lanza: --and supporting them with new products. I used to tell Costello, "The EDA companies are consulting companies that don't charge for consulting." <laughs> That's what they are, because they give customers an unfinished product and they keep modifying the product with the change of the requirements. So, they are really de facto-- they're consulting companies. The product that they're gonna have next year is different than what people bought. And it's gonna be different because they get inputs from the customer and make thing better for the evolution of the design.

Fairbairn: Yeah, I mean the challenge is that EDA companies are selling to people that are moving incredibly fast: You can't give them a fixed product.

Lanza: That's exactly--

Fairbairn: And so, the challenge is to keep up with the very pace of the semiconductor community.

Lanza: And the challenge was to acquire the company that had been capable of understanding that before you did. You couldn't do it <inaudible>

Fairbairn: Right, right.

Lanza: So, acquisition was not an admission of fault. It was a foundation of strategy. That's why it was exciting. It was-- and I used to tell Joe, because I never accepted the job offer. I was always a consultant. And I'd tell Joe, "I'm a consultant because I only want one connection. If you want to shed light on the market, the connection you want is to the top." Only one connection to you. And I want to be able to look around and not be tied down to what I'm doing, competing with the guy. I don't want to compete with anybody. I want to be able to say, "Okay, I see things I think are moving this direction." Oh, Joe coming-- Joe's a great guy-- coming to my office at night when after an incredibly exhausting day and say, "You know, I come here because I want to talk about big things." He was such a great guy. At the time he was-- he knew I didn't want to join officially, but he gave me title of vice president, senior vice president. And I had a card. <laughs>

Fairbairn: And still a consultant.

Lanza: Still consultant. And I remember I had an assistant, a secretary, and I was saying, "No, after I _____after here is Venture Partners. You know what? Don't worry; you're not competing. Let me know if you thinking there are some conflicts." "All right, yeah, I'll let you know if I think there is some conflicts." You know, I will. The investments I make, they know I'll do that. "Okay, good." I said, "They know I need to do stuff there, too." And he said, "Why do you need to do stuff?" "Because, I mean, the people there know what I'm doing. I need support, I need administrative support." He said, I know that. I'll give you another assistant who's gonna do your Venture Partner job for you." I had two assistants! <laughs> It was great. I had a more fundamental reason to go to US Venture, except when it was partners' meeting, all that stuff. But he tried to minimize--

Fairbairn: So he tried to minimize the amount of time you spent away from Cadence.

Lanza: Absolutely. It was great. It was incredibly creative from that point of view. And then at night he would come there and say, "Okay, let's talk about what to do, how to do it." And we-- I'll tell you. We did stuff in those days that were really, really exciting. And I remember when we acquired Comdisco Systems-- just as an example, we acquired Comdisco Systems. With Comdisco Systems, the fundamental problem at Cadence was that Cadence had a very, very, very good simulator and they were leading the Verilog… the rest. But the market, particularly large companies, were not pushing for Verilog in particular. They were pushing for VHDL.

Fairbairn: Mm-hm.

Lanza: So, we had to do something, because really what was happening is that we were losing. We were losing the _____. The large companies--

Fairbairn: Right.

Lanza: -- were gonna have VHDL.

Fairbairn: Right.

Lanza: And that's what it's gonna be. That's one of--

Fairbairn: Yeah, for a long time everybody thought that VHDL would eventually take over and--

Lanza: And that was it.

Fairbairn: Yeah.

Lanza: So when we decided Comdisco, one of the reasons why we did that was to move the entry level, because we were really losing the design compiler block .

Fairbairn: Mm-hm.

Lanza: We had a simulator, but we were losing design compiler block. So we had to move the entry level.

Fairbairn: Design Compiler it's a Synopsys synthesis product, right?

Lanza: Yeah. And we were losing it. It was clear losing it. So. But if we moved to the point where we would make entry points at the design level, at the design block level, at the IP level--

Fairbairn: Mm-hm.

Lanza: --we would not need necessarily our own simulator. We could have then people using the other simulator. We would have time to optimize our simulator for a different level of entry, which was gonna be IP level.

Fairbairn: Mm-hm.

Lanza: And I remember when we defined the term "IP". We wanted to define Silicon IP, or "SIP". I hated it. You know SIP in Italy, it was the name of the telephone company. It was one of the most technologically behind company you can think of. So, I hated the idea of using SIP as the term. So I started pushing IP as the term. Silicon--

Fairbairn: IP for intellectual property, right?

Lanza: That's right. "Silicon IP" we would call it, but it was IP. So, we tried to move the attention from the entry of the design compilation to the Silicon IP. That's why we acquired Comdisco Systems. And I remember we were talking to Comdisco Systems and we were talking about exactly that. Because Comdisco really was a leasing mainframe company and this thing was kind of a side thing.

Fairbairn: Yeah.

Lanza: It wasn't really the thing they wanted to be, and so we started talking to them to see if we could acquire them. And we were interested, they were interested. But what happened-- don't know the exact time now-- what happened is that Cadence stock-- it was December. The year will come to mind in a second. Cadence stock crashed in December and our negotiations with Comdisco Systems hit the wall. Hit the wall. And we-- the stock price went down to nothing. We were absolutely floored and with no way we could get Comdisco Systems at this point to work with us.

Ray Bingham came in; we started working on how to make the company come back up from where they had crashed. It was gonna be very, very difficult to get Comdisco System to work with us. But at a certain point-- maybe a couple of months, three months-- Ray Bingham had worked very well on taking all the issues of Cadence, Cadence accounting, Cadence-- just the terrible way that the previous management had established the systems at Cadence and brought up much nicer systems. So we went back to Comdisco Systems and we told them, "We really want to continue our conversations."

Lanza: Okay, by now we thought we had pretty much under control the future of Cadence, even though stock definitely did not reflect it. So we went back to Comdisco Systems and we wanted one more meeting. We talked to them and they said, "Wow, that's interesting." We told them how we thought what they had done in terms of defining the IP, the Silicon IP and all this. It was really interesting, in the communication world--

Fairbairn: Mm-hm.

Lanza: They had very nice high-level definition of things that were good from a system point of view. And we really wanted to go back on Comdisco System. And they said, "Well, great. We-- you and us talked about this already and we had an written offer from you, the enterprise, and the offer was this much." And this much was in dollars and we talked-- yeah, "It was this many shares." I said, "Yep."

Fairbairn: But at some assumed price.

Lanza: Yeah. The price before the end of December.

Fairbairn: Right.

Lanza: Now we're about six months later. We said, "Oh, okay. Well, we really want to continue this, and the good news: no change the price. Same number of shares." <laughs> "Say again?" "Same number of shares." "Let me understand. Your stock is six-x below; you say the same number of shares?" "Yeah, that's exactly what we said."

Fairbairn: Right.

Lanza: And they said, "Well, what's changed?" "What changed is that if you agree and you sign a non-disclosure, we give you a look at the books." "Okay." So we show them the books and where we were in the status and they said, "I think it's a good offer."

Fairbairn: Hm.

Lanza: But they said, "I think it's a good offer, but the same number of shares is okay with me, but one condition." We said, "Okay, what's the condition?" He said that "You tie the shares and you don't deliver to us now, you will deliver to us within three years."

Fairbairn: Mm-hm.

Lanza: "Because I know that in three years, the price will mature. So if you give us shares and you lock up for three years, we take it."

Fairbairn: Mm-hm.

Lanza: We gave it to them. And that was one of the most incredible deals because he did incredibly well and we got the IP that we wanted and we really positioned ourselves in a completely different way. This was right before you guys though. Right before.

Fairbairn: Mm-hm.

Lanza: But we wanted to just position ourselves there and talk about IP. I always used to tell Cadence people, the key when you are competing with somebody, the key is to do this: you need a vice and then squeeze. That's why I liked what you guys were doing. You know, on top. So I want to be there so you can squeeze them.

Fairbairn: Right.

Lanza: Once you have uniqueness here, uniqueness there, who cares about the price in the middle? You can change the price on the top and the bottom. So that's all I want to know.

Fairbairn: Right.

Lanza: So that was the strategy. And the Comdisco guys understood it perfectly. They were very excited about it. There are people in the industry today that still do not understand how we got the deal at a price that was obviously lower than the offers. Obviously lower, but that was a very-- it's far back enough that you talk to Vince Ricci, he will tell you exactly that. So we had a very--

Fairbairn: Well, they were financial people, right?

Lanza: Yep. They understood that perfectly.

Fairbairn: So that was the only language they really spoke. They probably couldn't even talk to you about the technical part of it.

Lanza: They related to that incredibly well and they looked at the numbers, they look at the books and said, "Absolutely. That's obvious. You guys are gonna be just <pops lips to mimic homerun>."

Fairbairn: Right.

Lanza: So they-- it was the right transaction. And sometimes you have to understand which language the other person speaks.

Fairbairn: Right.

Lanza: And then just adapt yourself.

Fairbairn: Right.

Lanza: So that was an interesting one. We did an acquisition of Seed, the VHDL company. Remember Seed?

Fairbairn: Mm-hm.

Lanza: And why did we acquire the VHDL company? Fundamentally, what happened there at Cadence was that we knew that we were losing battle. We were losing the emotional battle.

Fairbairn: Mm-hm.

Lanza: VHDL was a general thing. It was a standard and we had very low results.

Fairbairn: Right.

Lanza: So we were losing. No two ways about it.

Fairbairn: And nobody believed you would take VHDL seriously because V-- you'd always assume that Verilog was what you really wanted to sell.

Lanza: And that's why we went out to acquire Seed.

Fairbairn: Mm-hm.

Lanza: I was flying in from Europe. Joe Costello was flying from Cadence. We met somewhere in the-- somewhere. Where was the place? The middle of country. You know, I'm not gonna Alabama [ph?], but in some crazy place in the middle. And it was terrible weather. It was winter. We got in this car. We were cheap, so it was small car. While we were driving it was ice everywhere. And this big stone came smashing on the window, did not smash the window. It was incredibly strong. We were saying, "Do you realize, here is the senior VP of Cadence and the CEO of Cadence driving in the middle of storm and in the middle of nowhere to go out to a company that's three people?"

Fairbairn: <laughs>

Lanza: Three people! The two of us are doing that and people are gonna question our mindset. Whatever.

Fairbairn: Right. What are you thinking?

Lanza: What are you thinking?! The public company! So anyway, we went there, and we convinced them that we were serious about the VHDL, which we were, 'cause we needed to have a serious presence. We needed to have credibility. They had credibility, so we brought them in. That's what we did. And then-- ah, there's so many stories I can tell about this. Then-- now we had the VHDL offer, but we still identified with Verilog.

Fairbairn: Verilog. Right.

Lanza: What are we gonna do? Well, we said, "Well, we need to start an initiative," because I remembered the initiative of Ethernet on Intel.

Fairbairn: Mm-hm.

Lanza: I said, "We need to start and initiative--" inter _____, and the ASIC initiative at Cadence. So you needed to get some momentum behind this, not just you. So ,to understand initiatives. So, well, we should talk to people that are in the-- how is it, entire system like this-- that are in the VHDL camp and show them, convince them this is-- we're serious. How do you convince somebody that you're serious? Well, one way, which is what we did at Daisy, was to show that you have a solution for something nobody else has and then you go out with the ad, "How many libraries--?" And ASIC Lab is your competitor support. That's one way. Another way is to-- as if you don't have anything-- is to identify what is the

smallest-- the biggest drawback and weakness of your competitors and make a big deal out of it and make it the center of attention. So change the thing on how good it is to what is missing.

Fairbairn: Mm-hm.

Lanza: How do you do that? Well, this was-- we were right before the Design Automation Conference. And that's what I was thinking-- Daisy -- right before the Design Automation Conference. So, we said, "<whispers> What are we gonna do?" So we said, "Well, we should do this, we should take the initiative like we did at Intel with Ethernet or at Daisy with the ASIC library. Let's take the initiative and drive a standard." So, Costello said, "Well, that's a great idea. That's what we should do." "Well, you, Joe, should find a couple of people that are willing to do it. We have only four days till this Design Automation Conference." So, I tell him we want to do it and we put work on some marketing campaign.

So, okay. So, first of all, it comes out to "What are we gonna do?" Well, what is the-- I was talking to the guys at-- _____ was one of the four people. And now the VHDL guys, what is the weakness of VHDL? What is it? "It's great: The real weakness is that we don't have libraries." "Oh!" I said, "That's great." So, the real thing we need to get the industry to focus on the lack of libraries. How do you do that? I said, "I know how you do that! We start an industry program. We call it VITAL."

Fairbairn: <laughs>

Lanza: He said, "VITAL?" I said, "Yeah, VITAL. Like, vitality. Vital. We really want VHDL to succeed." "And you call it VITAL?" "Yeah." What does it stand for? "VHDL Initiative Towards ASIC Libraries"--

Fairbairn: <laughs>

Lanza: --'cause they don't have them. <laughs> So the second people say, "What is VITAL?" "It's the VHDL Initiative to just fix the biggest problem, which is libraries!" Everybody's gonna come in and say, "These guys don't have libraries. Let's focus on libraries. They're the most important thing to do. It's vital for VHDL to have an initiative to fix the libraries. That's what we need to do. VITAL is the program." <laughs> We came up with "VITAL-- <laughs> VHDL Initiative Towards ASIC Libraries". And then we had the consortium going towards that.

Fairbairn: Right.

Lanza: So we announced it as VITAL. Everybody moved the attention on the fact that there is a general language, that it is open, and that is industry-wide to the fact that there are missing libraries. <laughs>

Fairbairn: Missing libraries. Right.

Lanza: There're no libraries. We don't do designs. So that's the entire thing. And then I will never forget it because at this point the Design Automation [Conference] happened and it was-- I think it was in Texas. I don't know where it was. But I remember that I walking at the Design Automation-- at the hotel. I don't know which one it is. And here's Harvey Jones-- at the time he was CEO of Synopsys.

Fairbairn: He's now at Synopsys, right.

Lanza: CEO. So, he comes there and he says, "How are you?" "Ah, good." And he says, "Ah, great. I saw you've been with consulting with Cadence." "Oh, yeah, oh, yeah. I was working on this thing, VITAL." He said, "I saw your hand. We knew it was you. Well, I saw your hand. We know." "I came up with the name." He said, "I know."

<laughter>

Lanza: He goes, "I can see that."

<laughter>

Fairbairn: He'd already seen your work in libraries at Daisy, right?

Lanza: Which I thought was a great point, because I admired his marketing skills and just his intuition. Obvious! So ,the fact that here was this kid that was standing-- yeah, it was a good thing. I understand.

Fairbairn: He knew exactly what you were doing.

Lanza: I loved it! So then VITAL was very good to reposition, if you want to reposition in the industry movement. And I think we won. And we won. Everybody was looking at that. Nobody had the energy to do the libraries. The point is that once you did that, you could make a movement into just making everything move towards IP, because you had the entire flow underneath done. So that's really what the entire game was, was trying to do that.

But I always made mistakes when I did these things. Because the main mistake I made as a strategist-- and I'm very upset about it. I did it not once. I did it more than once. When I acquired Comdisco-- when Cadence acquired Comdisco Systems, we took it away under the nose of Chi-Foon.

Fairbairn: Mm-hm.

Lanza: He still tells me he does not know how I did it. We are friends. He and I worked at Intel at the same time.

Fairbairn: Right, yeah, okay.

Lanza: He was at Intel when I joined in '76, whatever. So we-- and he still doesn't understand. And the interesting thing is when we did that, I didn't realize the best thing to do is to buy not just the main IP company, but both at the top companies. We should have bought COSSAP.

Fairbairn: Oh, yes.

Lanza: And we didn't.

Fairbairn: Right.

Lanza: He (Chi-Foon) went and bought it and we did not have the upper hand. It was a big mistake. I should--

Fairbairn: COSSAP was a European company competing with Comdisco.

Lanza: Correct. Correct. Same mistake I did on Verilog.

Fairbairn: Mm-hm.

Lanza: We should have bought the John Sanguinetti's company. The Verilog company. We didn't. It was a big mistake. We should have done it and we didn't. It was Chronologic.

Fairbairn: Right. They were much faster.

Lanza: It was faster, it was compiled.

Fairbairn: Right.

Lanza: It was not interpreted.

Fairbairn: Right.

Lanza: So the entire thing-- and we let them go to Viewlogic. And when they failed, we even didn't go and pick it up. It was--

Fairbairn: Right.

Lanza: Terrible. As a strategist, I failed. I should've done it.

Fairbairn: You could've taken it all off the table.

Lanza: Take it off the table.

Fairbairn: Yeah.

Lanza: Once you're there-- poom, poom! When they're both small, so there's no--

Fairbairn: Right.

Lanza: Yeah, there is no anti-trust. There is nothing. Whssh! Take the two and get the guy with two percent. Not with thirty percent.

Fairbairn: Right.

Lanza: So I repeat my mistakes. But that gives you an idea of what was happening.

Fairbairn: Right.

Lanza: And this VHDL thing and this initiative was-- I always liked the VITAL thing. And-- but, in general, the concept of libraries, it was something very important in my mind. You know that. It was one of the few people in the industry that had the same vision of libraries. Give us libraries. There is--

Fairbairn: Mm-hm.

Lanza: And in my mind, just like the libraries of ASIC or Daisy were extremely important-- whatever. That's what we came up with in an ad. I mean that was-- the concept of libraries was extremely important. That's why at Cadence, I tried to get them to buy Artisan Components.

Fairbairn: Mm-hm.

Lanza: Because I felt you need to take control of libraries. That is gonna be the entry for the ASIC. We tried to buy them; they didn't want to be acquired. Since they didn't want to be acquired, I decided to try to invest from US Venture Partners.

Fairbairn: Mm.

Lanza: Now I had both hats. So, what happened is that I was talking to Templeton, who was here. "I know I really like to work with you guys." He says, "Oh, we don't really want to be acquired by Cadence, too big," whatever. So, I kept working with him and he said, "Well, yeah, I also have the USVP hat and would come here, see what you're doing. We have a talk." <laughs> One time-- they were doing very well. I was _____, not, "I really think that I would like invest in you guys. You say 'No' to Cadence. How about investing with US Venture Partners?" And he said, "What is your value added?" "Well, why don't we work together for a while and find out." So after a few months I said, "So, what do you think?" He said, "Yeah, I like working with you."

Fairbairn: Mm-hm.

Lanza: And he said, "What would you do if you were an investor here and you were on the board? What would be the first strategic move?" And I said, "At this point, the biggest problem that you have is that you have very good customers. You are completely booked. You have no one cycle. You're working your butt off. And you're not making much money." "So what should I do?" "Raise the price."

Lanza: "What do you mean?" "Significantly raise the price. Tell people that libraries are gonna be far more expensive and they have to just stick with you." And he told me-- you can talk to him. He's a great guy to talk to. He told me he couldn't sleep at night because he knew he was gonna bet the company.

Fairbairn: Mm-hm.

Lanza: But he came back and he decided to do it.

Fairbairn: The CEO at the time was--?

Lanza: Mark Templeton.

Fairbairn: Mark Templeton. Okay.

Lanza: He decided to do it. He came back; he decided to do it. And I thought, "Great." And sure enough, didn't lose one customer. None. He became far more profitable. And so now he was doing well and then I said, "Well, you know, now you see why I think I can contribute to you, your company." So, he said, "Okay, so what's your offer?" So, I offered some money from US Venture Partners. And he said, "Okay." I said, "Well--" I said, "What do you want for it?" I gave a price. He said, "Well, I'd like a bigger--" So a negotiation of the price for a few minutes. We decided on a price and he said, "What's gonna be your contribution?" I said, "You know my contribution. I'm gonna be trying to do-- work strategically with you." He said, "Okay." So, he decided it was good and he would hire me as a board member, which I did. And he accepted the money from US Venture Partners.

Now, interestingly enough, he never used a dime of US Venture Partners. He got the money, he put it in the bank. Then we sat down and we defined the strategy. And I told him, "You know, the problem we are having is that people like our libraries. But you keep fighting on the price of the libraries. And when you deal with the VP of purchasing, purchasing agent from a company, they have you and your competitors--" various competitors in those days-- "and you have to understand when you go to the purchasing guy, VP of purchasing in a company they have only one dimension: price. Only one knob: how much you charge? Only one direction: down. So you go there and they're gonna put you against Prabhu Goel's company, against other companies, and they're gonna say, 'Those guys have this price.'" I said, "Well, you're in the situation. Unfortunately, there is no limit to how far down they will push you."

Fairbairn: Mm-hm.

Lanza: "They will push you down to zero." He said, "Yeah, and we see that's happening." "Okay, so maybe the price should be zero? So, the price should be zero." He said, "Crazy." "No. The price should be zero and you should charge who's getting benefit out of this, which is the foundry." So, zero for the users, price for people who make money. He told me that was nuts. He went home, and he was thinking it was nuts. Absolutely nuts. He thought it was impossible. He came back and he said, "It's crazy, but let's see what TSMC says." So, we went to TSMC, he negotiated with TSMC a royalty and, out of payment for building up the libraries, he went out and we gave zero price for libraries. The only condition we had is that when you use them, if you improve them, we get the improvements, which was the fundamental move. Fundamental. Because now nobody could compete. And we got to the point where companies would disappear. Literally, disappear in front of our very eyes. They could not compete with zero. Nobody could compete with zero. And we had TSMC already using our libraries.

Fairbairn: Right.

Lanza: There was no way anybody could compete. That was exactly what happened. And the interesting thing is that TSMC came back and said, "We don't know enough about libraries, we don't want to sell them. You know a lot about libraries. You will sell the libraries and we will give you the royalties." That business model, that is what made Artisan. And, by the way, independently of anything we have ever done and independent from this is what made ARM They did it completely independent. I'm not taking any credit. But they did it completely. It was the same business model, identical. They were selling very strong intelligence in computer science. We were selling gates. We were selling NAND gates and getting royalties, which was-- how can we do that? <laughs> How we are doing that? So that was the Artisan model and it was a very important one. And in my mind, because it was novel. We destroyed competition. Destroyed it. Really, nobody could compete. And we became the absolute standard to the point that Artisan Components-- at a certain point when we were well established, we would deliver one full library every six hours. So we were-- literally, we were a library factory. That's what we were doing.

Fairbairn: Mm.

Lanza: People want variations and different kind of things-- every six hours. That's what we were doing. They were saying, "You have great technology." Yeah. Enough technology to be viable, but fundamentally we eliminated a big concern of people and we have-- the people want it or not-- given a portability. If you are on Artisan libraries, you import them. We take care of the porting upfront. And when the node comes to you, it's ready if you are using Artisan libraries.

Fairbairn: Right.

Lanza: So that was the entire thing. So, we shifted from being a tax on the CAE companies, like we did with the Daisy Systems, to being fundamentally something that has no attributed value, has a future value.

Fairbairn: Mm.

Lanza: And that was completely different. So that--

Fairbairn: Okay, we need to--

Lanza: Last one I'm gonna give you on this. I want to give you the--

Fairbairn: Okay.

Lanza: <overlapping conversation, inaudible>-- of this. So Artisan ended up investing from US Venture Partners. Another element is interesting in this business was one thing I ended recognizing from Cadence and from some of the investments at US Venture is that it was a very big difficulty in transferring things to manufacturing. And I found that there was a company, it was starting in Pittsburgh, called PDF Solutions--

Fairbairn: Yeah.

Lanza: --which was doing, if you want, the physical level of the interface. If you want you could consider the Silicon level of the library, Silicon below Artisan. So, I wanted to invest in that because I thought it was another big level. And the interesting thing there was that I wanted to do that and at this point I was very strongly into Cadence. I thought it was a very good thing interacting in the Cadence product line behind the Cadence physical layer. So, I tried to get Cadence to invest. Cadence first, unbeknownst to me, tried to acquire them, and then the company was really interested in investment from Cadence, but not just from Cadence. So, in PDF I get an investment from Cadence and from US Venture Partners.

Fairbairn: Venture Partners!

<laughter>

Fairbairn: Delivered the package.

Lanza: I delivered the package, one from the right--

Fairbairn: Right.

Lanza: So I brought them in.

Fairbairn: Right.

Lanza: And they came back up and they interested in there is, since everybody knew about the fact that there was this royalty system and their people like royalty, but they were really mad at me for the royalty system. In this case I didn't want to use the term royalty because it was tainted. So I used the term "gain share".

Fairbairn: Mm-hm.

Lanza: 'Cause I'm gonna show you, you're gonna save. Since you save, you pay based on your savings. But this is still a similar system. So I started doing investments of this kind and at the end of '95 I think was-- I was getting to the point things were really getting a little too heavy to maintain two jobs at the same time. And I decided that I would move full-time to US Venture. So, first, started-- I helped Cadence start their venture arm and I did put together venture arm. The first investment of the venture arm was PDF. And then we decided that I would just move to US Venture Partners, which I think it was '96 when I did that, if I do remember correctly. And with US Venture Partners I did investments there for most of the time and at that point I left Cadence, and it was my last act as an active executive in a EDA company. So then I started making investments and that was the rest about it.

Fairbairn: So then you went to US Venture Partners and then when did you form-- was the next step to form your own venture firm?

Lanza: Yeah, I stayed there from-- until 2000, end of the year 2000. And the year 2000 what I found out was that we had made a lot of good investments and I was very excited about many of them. Artisan had gone public and PDF was doing very well. I'd taken public a few more companies. But what happened is that they were going to raise a billion dollar fund. Wasn't my strength to look at huge investments. I like much more to deal-- do seed level and because you cannot do billion dollar seed.

Fairbairn: Right.

Lanza: I don't think so. And we just decided since I really to do earlier stages I would just-- we would part friends. And so, I moved out and I started doing-- I started Lanza Tech Ventures. And I started to invest on my own and based mainly on the expertise and experience I acquired at US Venture Partners.

Fairbairn: So how long-- how big a fund-- funds have you raised at Lanza Ventures and what type of investments do you make?

Lanza: Lanza Ventures is mainly Lanza's family money.

Fairbairn: Okay.

Lanza: I have a different concept. If I do invest with more than one investor, I like to get some angels and I do one-shot funds. So one shot, I bring in various investor and that is the team who's gonna be investing

in that specific area. I've done a few of those. I've been investing, I would say mainly in stuff that looks at sophisticated technical software as a disruption engine for an industry.

Fairbairn: Mm-hm.

Lanza: Whether that is the oil industry or whether that is the display industry, whether that is the pharmaceutical industry doesn't matter. If I can see that some sophisticated software can make a significant disruption in any of those three, I will look at that very, very, very attentive. In a sense, this is what PDF was on the manufacturing side.

Fairbairn: Right.

Lanza: Or what Intrinsa was in the software side. So I try to look back and say, "Well, that seemed to be where I have the best intuition and that's where I can start from scratch." Because it was our industry: information--

Fairbairn: Mm-hm.

Lanza: --and not the leader. A billion dollar and going. A few tens-- a few million dollars, most maximum ten. I always say, "One-digit, total money", I used to say. So that's what I've been doing. So, at this point, I've been doing anything from looking at some investments in oil and gas and done some investments in pharmaceutical and drug discovery, specifically in the area of what we call machine-learning for computational chemistry.

Fairbairn: Mm-hm.

Lanza: And that is an area I'm assisting more and more. And that's what we're doing for ten years-- in thirteen years.

Fairbairn: Well congratulations. I'd like to wrap things up now. Do you have any final comments-- is this the direction you're continuing to follow in terms of your investments, or do you anticipate any changes based on technical changes that you see in the industry? And is there something else that--?

Lanza: Let me put it this way. I think that paying attention to how technology will disrupt which new segment of the industry is fundamental for success-- and I have isolated some industries-- and see whether there is elasticity to increase in computer capabilities. It means if I increase two, I get an improvement of four.

Fairbairn: Right.

Lanza: Elasticity to a certain level of exponential.

Fairbairn: Right.

Lanza: From this point of view I think there are few industries where the elasticity is obvious. So I stay away from consumers, per se. But the elasticity, in particular, in the pharmaceutical industry and the drug discovery industry-- and the health system in general is huge -- whether it is in sensors, whether it is in surgery, devices, or drug discovery. Those are all areas in which you can see the intuition that more computer power would make a huge difference in the way we discover cures for diseases. It's obvious, absolutely obvious. Whenever you see the increase in exponential investments in an industry, increase in an investment industry, going exponential--

Fairbairn: Mm-hm.

Lanza: --and the discovery going down linearly the system is wrong. It's dead. Should be the other way.

Fairbairn: Right.

Lanza: The leverage began this way and the discovery becomes exponential. That's normal. <laughs> That other way you are clapping your hands this way. So that is an area I'd like to stay in. I keep looking at industry -- trying to understand which other industry can be disrupted by exploiting a natural treadmill. Being a small fund, I don't want to find which big treadmill I have to finance. I want to find out which big treadmill is going and how can I exploit that treadmill going to make little things that is--

Fairbairn: Right. Bigger.

Lanza: Yeah. I don't want to create a dart board.

Fairbairn: Right.

Lanza: Somebody can create a dart board. I want to throw darts.

Fairbairn: Right.

Lanza: That's it. Okay?

Fairbairn: All right, well, that's a great way to summarize the situation. Thank you very much for spending--

<recording ends abruptly>

END OF INTERVIEW